Earth's Paleobiosphere

ES-6 The student will demonstrate an understanding of the dynamic relationship between Earth's conditions over geologic time and the diversity of its organisms.

ES-6.3 Summarize how fossil evidence reflects the changes in environmental conditions on Earth over time.

Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/future knowledge: Students were introduced to fossils, and some of the types of fossils, in 3rd grade; they also studied how fossils could give scientists ideas about early environments. In 8th grade students summarized how scientists used many types of fossils to study Earth's diverse life forms and changing environments. In Earth Science students will develop this concept further as they study evidence from fossil populations of organisms that indicate changes in their environment.

It is essential for students to know that there are various types of fossils.

- Some may be direct evidence of the organism such as shells, bones, or plant fragments.
- Others may be indirect evidence, such as tracks, trails, or footprints.

(Students may review the various types of fossils from their previous learning.)

- A fossil is considered to be *originally preserved* when the organism remains as it was when it died;
- A fossil is considered to be an *altered* fossil when all of the organic material has decomposed and been replaced by minerals deposits.

Fossils of all types furnish scientists with clues to changes that have occurred in Earth's past history, such as changes in climate and environment.

- If a fossil of a warm climate reptile is found in a northern colder region today, the fossil indicates that that area once had a tropical climate.
- Tropical plants have been found in Antarctica; fossils of marine animals have been found far from any ocean.
- Students should be researching examples of fossil organisms that give scientists these clues.

The study of fossils allows scientists to

- describe how organisms have changed through time;
- have evidence of ancient environmental conditions;
- find patterns and cycles that can be used to predict future phenomena, such as climactic changes;
- locate energy resources based on the environmental conditions needed for fossil fuels to have formed.

It is not essential for students to know how each fossil type was formed, unless this is in context of review. This indicator is not a complete study of the environmental conditions on Earth over time.

Assessment Guidelines:

The objective of this indicator is to *summarize* how fossil evidence reflects changes in environmental conditions on Earth; therefore, the primary focus of assessment should be to generalize major points what fossils can reveal about these changes.

In addition to *summarize* appropriate assessments may require students to:

- *recall* different types of fossils;
- *exemplify* fossils that could be found in various environments; or
- *infer* a type of environment based on fossil evidence.